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052-244-4205
Perform Electrical Project Management
Status: Approved

Distribution Restriction: Approved for public release; distribution is unlimited.

Destruction Notice: None

Foreign Disclosure: FD3 - This training product has been reviewed by the developers in coordination with the Fort Leonard Wood, MO foreign disclosure officer. This training product cannot be used to instruct international military students.

Conditions: As a Prime Power or Power Line Distribution Supervisor assigned a project, you are given a project directive, the unit standing operating procedure (SOP), Field Manual (FM) 5-412, paper, a pen, a pencil, and a calculator. This task should not be trained in MOPP 4.

Standards: Perform electrical project management according to FM 5-412. Include an activities list with a preceded immediately by (PIB) column and a logic diagram. Calculate the activity durations and resources and the activity start and finish times to ensure that the mission is performed safely and effectively from start to finish.

Special Conditions: None

Safety Risk: Low

MOPP 4: Never

Task Statements

Cue: None

DANGER

None

WARNING

None

CAUTION

None

Remarks: None

Notes: None

Performance Steps

1. Prepare an activities list according to FM 5-412.

Note: Do not consider the time, labor, equipment, order of operations, or materials required.

a. Check the list for completeness and accuracy.

b. Include a PIB column and a logic diagram.

c. Calculate the activity durations and the early and late start and finish times.

d. Determine the number of activities by breaking the job into separate activities with enough detail to complete the job.

Note: The number and detail of the activities will vary from job to job.

e. Include a brief description of the work to be performed in each activity.

f. Calculate the total float (TF), the free float (FF), and the interfering float (IF) time for each activity.

2. Complete the PIB column of the activities list according to FM 5-412.

a. Determine activity relationships by deciding which activity depends on the completion of another activity before it can begin. Consider the following:

(1) Whether the activity can start at the beginning of the project.

(2) Which activities must be completed before another one can start?

(3) Which activities can start or finish at the same time?

(4) Which activities cannot begin until another activity is completed?

b. Record in the PIB column (to the right of each activity) the number of any other activities that depend upon its completion. Write "none" in the PIB column if an activity does not depend on any other activity.

3. Calculate activity durations and required resources on an activity estimate sheet according to FM 5-412.

a. Determine the quantity of work (the total amount of material to be installed or produced). For example, if installing three runs of cable at 1,000 feet per run, 3,000 feet would be the quantity of work.

b. Determine the work rate according to FM 5-412, which lists the work rates for most activities performed by an engineer squad. Record each type of work in units. For example, if installing a direct burial cable, 1,000 linear feet would be the unit. If digging trenches by hand, cubic yards would be the unit.

c. Calculate the standard effort by dividing the quantity of work by the unit for that type of work. Do not round out the total. Record the total two places past the decimal, and drop the remainder. Multiply the total quantity by the man-hours required per unit. This total represents the standard effort. Do not round out the answer. Record the answer to two decimal places.

d. Determine the efficiency factor. This is the efficiency of your Soldiers to perform a task. The charts in FM 5-412 are calculated at 100 percent efficiency. If you believe that your Soldiers are not 100 percent efficient, record what you believe is their efficiency factor.

e. Calculate troop effort. Divide the standard effort by the efficiency factor. This total is the troop effort. Do not round out the answer. Record the answer to two decimal places.

f. Record the crew size. Do not consider the supervisor as part of the work crew.

g. Calculate the activity duration by dividing the troop effort by the crew size and then rounding the answer to the next highest number if there is a decimal. This is the duration for the activity.

4. Develop a logic diagram with the correct activity node numbering according to FM 5-412.

a. Prepare a logic diagram that consists of the start and finish nodes, the activity nodes, and the precedence arrows.

b. Place the start and finish nodes, represented by either a circle or an oval, at the beginning and the end of the logic diagram because they do not have duration times.

c. Annotate each activity on the activities list in the logic diagram as an activity node. The activity nodes contain the early start and finish times, the late start and finish times, and the activity number and duration and are represented by a parallelogram.

d. Complete the activity at the tail of the precedence arrow before completing the activity at the head. Precedence arrows show the order and relationship between activities and represent zero time.

e. Use increments of 5 or 10 when numbering activity nodes.

f. Number the activity nodes according to FM 5-412. For example, every activity node must be different and the activity node at the head of the precedence arrow must be greater than the one at the tail of the arrow.

5. Calculate the correct early start and early finish and late start and late finish times according to FM 5-412.

a. Locate the early start time in the upper left portion of the activity node.

Note: All activity nodes that come off the start node will have an early start time of zero.

b. Locate the early finish time in the upper-right portion of the activity node and calculate by adding the early start time to the activity duration.

Note: The early finish time of the activity at the tail of the precedence arrow becomes the early start time of the activity at the head of the arrow. If there is more than one activity leading into a single activity, the highest early finish times of all incoming activities become the early start time of the new activity. Continue to calculate the early start and finish times throughout the logic diagram following this process.

c. Record the highest early finish time in the finish node of the logic diagram.

d. Locate the late finish time in the lower-left portion of the activity node.

Note: All activity nodes that come directly out of the finish node will have the highest early finish time that was recorded in the finish node as the late finish time.

e. Calculate the late start time for the activity by working backwards through the logic diagram and subtracting the duration of the activity from the late finish time.

Note: The late start time of the activity at the head of the arrow becomes the late finish time for the activity at the tail of the arrow.

f. Use the lowest late start time as the late finish of the incoming node when two or more activity nodes lead into one.

g. Continue the process of working backward through the logic diagram.

6. Identify critical paths on a logic diagram according to FM 5-412.

a. Identify the critical activities by using the following three rules:

(1) The early start time for a particular activity is the same as the late start time.

(2) The early finish time for a particular activity is the same as the late finish time.

(3) The early start time or late start time added to the duration of the activity results in the early finish time or the late finish time.

Note: None of the activities on the critical path will have a float time.

b. Mark the critical path beginning at the start node and working through the logic diagram by following each precedence arrow line. If all of the activity nodes on the line are critical, then it is the critical path. Mark the critical path by either highlighting the precedence arrow lines or drawing a double precedence arrow line from the start node to the finish node. It is possible to have two or more critical paths through the same logic diagram.

7. Calculate the TF time according to FM 5-412 by subtracting the early start time from the late start time or subtracting the early finish time from the late finish time. Either method will equal the TF time for that activity.

8. Record the TF at the top-outside edge of the activity.

9. Calculate the IF time according to FM 5-412 by subtracting the early start time of the activity at the head of the precedence arrow from the late finish time of the activity at the tail of the arrow.

10. Record the IF at the top-outside edge of the activity node.

11. Calculate the FF time according to FM 5-412 by subtracting the IF time from the TF time for each activity.

12. Record the FF time at the top-outside edge of the activity node.

13. Complete an early start schedule according to FM 5-412.

a. Record the activity node numbers in numerical order in the column marked "network number."

b. Record the PIB activities in parentheses to the right of the activity numbers.

c. Place an activity start bracket for each activity by taking the early start time from the activity and adding the number one to it. For example, if an activity node has an early start time of 5, then 5 + 1 = 6. Locate the box for day six on the early start schedule, and place a bracket against the left edge of the day six box for that activity.

d. Place an activity end bracket by taking the late finish time from the activity node in the logic diagram and adding the TF time for that activity. For example, if an activity has a late finish time of 14 and a TF time of 3, then 14 + 3 = 17. Locate the box for day 17 on the early start schedule, and place the end bracket against the right edge of the box for that activity.

14. Record the required resources on an early start schedule according to FM 5-412.

a. Find the required resources for each activity in the bottom-center portion of the activity node.

b. Record the required resources by beginning at the start bracket and placing the number of resources inside each box along the activities line. Do not exceed the activities duration. Stop at the early finish time. The remaining boxes between the start and end brackets will become either FF time or IF time later.

15. Record the IF time on an early start schedule according to FM 5-412.

a. Calculate the IF time. Refer to step 9.

b. Record the IF time. Refer to the activity numbers listed in the network number column of the early start schedule. If an activity has other activities that depend on it being completed before they can begin, that activity may have IF time. Find the start bracket of the dependant follow-on activity. If it begins within the start and end brackets of the previous activity, IF time is present. Place an "X" in each remaining box until you reach the end bracket of that activity. This represents the IF time within that activity. Once IF time has started in an activity, all remaining time periods along the activity lined up to the end bracket become IF time.

Note: Any blank box along an activity line within the start and end brackets represent FF time.

16. Record the total resources on an early start schedule according to FM 5-412.

a. Record the total resources required for each time period or day at the bottom of the early start schedule.

b. Add all the resources annotated for that time period from top to bottom.

c. Record that total at the bottom of the early start schedule. This represents the total resources required for that day of the project.

(Asterisks indicates a leader performance step.)

Evaluation Guidance: Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

Evaluation Preparation: Setup: Provide the Soldier with the items listed in the conditions.

Brief Soldier: Give the Soldier a requirement to perform electrical project management.

PERFORMANCE MEASURES	GO	NO-GO	N/A
1. Prepared an activities list according to FM 5-412.			
2. Completed the PIB column of the activities list according to FM 5-412.			
3. Calculated activity durations and required resources on an activity estimate sheet according to FM 5-412.			
4. Developed a logic diagram with the correct activity node numbering according to FM 5-412.			
5. Calculated the correct early start and early finish and late start and late finish times according to FM 5-412.			
6. Identified critical paths on a logic diagram according to FM 5-412.			
7. Calculated the TF time according to FM 5-412 by subtracting the early start time from the late start time or subtracting the early finish time from the late finish time.			
8. Recorded the TF at the top-outside edge of the activity.			
9. Calculated the IF time according to FM 5-412 by subtracting the early start time of the activity at the head of the precedence arrow from the late finish time of the activity at the tail of the arrow.			
10. Recorded the IF at the top-outside edge of the activity node.			
11. Calculated the FF time according to FM 5-412 by subtracting the IF time from the TF time for each activity.			
12. Recorded the FF time at the top-outside edge of the activity node.			
13. Completed an early start schedule according to FM 5-412.			
14. Recorded the required resources on an early start schedule according to FM 5-412.			
15. Recorded the IF time on an early start schedule according to FM 5-412.			
16. Recorded the total resources on an early start schedule according to FM 5-412.			

Supporting Reference(s):

Step Number	Reference ID	Reference Name	Required	Primary
	NTRP 4-04.2.3/TM 3-34.41/AFPAM 32-1000	Construction Estimating (HTTPS://NDLS.NWDC.NAVY.MIL) https://armypubs.us.army.mil/doctrine/DR_pubs/dr_aa/pdf/tm3_34x41_PH_Navy.pdf	Yes	No
	NTRP 4-04.2.5/TM 3-34.42/AFPAM 32-1020/MCRP 3-17.7F	Construction Project Management (HTTPS://NDLS.NWDC.NAVY.MIL) (https://armypubs.us.army.mil/doctrine/DR_pubs/dr_aa/pdf/tm3_34x42_PH_Navy.pdf)	Yes	No

TADSS : None

Equipment Items (LIN): None

Materiel Items (NSN) :

Step ID	NSN	LIN	Title	Qty
No materiel items specified				

Environment: Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to the current Environmental Considerations manual and the current GTA Environmental-related Risk Assessment card. Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT.

Safety: In a training environment, leaders must perform a risk assessment in accordance with ATP 5-19, Risk Management. Leaders will complete the current Deliberate Risk Assessment Worksheet in accordance with the TRADOC Safety Officer during the planning and completion of each task and sub-task by assessing mission, enemy, terrain and weather, troops and support available-time available and civil considerations, (METT-TC). Note: During MOPP training, leaders must ensure personnel are monitored for potential heat injury. Local policies and procedures must be followed during times of increased heat category in order to avoid heat related injury. Consider the MOPP work/rest cycles and water replacement guidelines IAW FM 3-11.4, Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection, FM 3-11.5, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination. All safety considerations are mentioned in the task performance steps and are annotated as DANGERS, CAUTIONS and WARNINGS. A thorough risk assessment must be completed prior to every mission or operation.

Prerequisite Individual Tasks : None

Supporting Individual Tasks : None

Supported Individual Tasks :

Task Number	Title	Proponent	Status
052-204-1128	Interpret an Electrical One-Line Diagram	052 - Engineer (Individual)	Analysis
052-204-2207	Conduct a Safety Briefing	052 - Engineer (Individual)	Approved
052-204-2211	Develop a Bill of Materials (BOM) List	052 - Engineer (Individual)	Approved

Supported Collective Tasks :

Task Number	Title	Proponent	Status
05-BN-5000	Conduct General Engineering Support Missions	05 - Engineers (Collective)	Approved
05-PLT-5725	Install Aerial Electrical Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-PLT-5723	Install Prime Power Generation Equipment	05 - Engineers (Collective)	Approved
05-PLT-5724	Install Expedient, Surface-Laid, Electrical-Power Distribution Equipment	05 - Engineers (Collective)	Approved
05-PLT-5728	Assess Power Generation Systems for Damage	05 - Engineers (Collective)	Approved
05-CO-5001	Perform Project Management	05 - Engineers (Collective)	Approved
05-PLT-5727	Install Underground Distribution Equipment	05 - Engineers (Collective)	Approved

ICTL Data :

ICTL Title	Personnel Type	MOS Data
Construction Engineering Technician Warrant Officer Basic Course ICTL	Warrant Officer	MOS: 120A, Skill Level: CW2, Duty Pos: KDC
12Q40, Power Line Distribution Specialist, skill level 4	Enlisted	MOS: 12Q, Skill Level: SL4